Leak Detection Systems Evaluation and Recommendations for the Underground Field Constructed Tanks at the Red Hill Underground Fuel Storage Facility

I. Background

The Red Hill Underground Fuel Storage Facility (Facility) is an underground complex of 20 very large field constructed underground storage tanks (USTs), four large USTs and associated piping located near Pearl Harbor on the island of Oahu in Hawaii. The Facility is owned and operated by the U.S. Navy and was constructed from 1940 – 1943. The facility is located 2.5 miles west of Pearl Harbor. The USTs were constructed by tunneling into the volcanic mountain and constructing the tanks inside the mountain. This link provides a short history of the construction of the Facility: https://www.youtube.com/watch?v=Ilz8IstwnWU

Each of the 20 tanks at the Facility is approximately 250 feet high and 100 feet in diameter. The storage capacity of each tank is about 12.5 million gallons, for a total Facility capacity of about 250 million gallons. The tanks are constructed of ¼ inch thick steel plates, welded together, and backed by a layer of concrete and rebar and the volcanic rock of the mountain. Each tank is connected to a pipeline which runs through an underground tunnel from the Facility to a fueling pier at Pearl Harbor. The tanks are oriented in two rows of ten tanks, numbered 1 -20, with tanks 1 and 2 being the western most tanks (closest to Pearl Harbor) and tanks 19 and 20 being the farthest east tanks (located furthest from Pearl Harbor).

Over its 70 year life, the Facility has stored a number of different types of fuel, including bunker fuel, aviation gasoline, motor gasoline, marine diesel, and jet fuel. Currently the Facility stores marine diesel fuel, Jet Propulsion Fuel Number 5 (JP-5) and Jet Propulsion Fuel Number 8 (JP-8). Based on anecdotal information the Facility has experienced fuel releases in varying amounts from a number of tanks. These suspected releases have occurred since the Facility became operational in 1943.

The Facility is adjacent to and above two drinking water aquifers that together supply approximately 25% of the drinking water for the residents of Oahu, HI. In January 2014, the U.S. Navy reported that an estimated release of 27,000 gallons of JP-8 from Tank #5. Tank #5 had been recently inspected and refurbished and was being re-filled when the release was discovered. Upon discovery, the U.S. Navy emptied Tank #5 and re-inspected the tank interior in order to ascertain from where the fuel leaked. 17 suspected release points were discovered during the re-inspection. At this time, the U.S. Navy and the U.S. EPA are engaged in negotiations to evaluate the existing leak detection systems for the field-constructed USTs and to determine the extent, feasibility and potential performance capabilities of implementing improvements to these existing systems.

II. Scope / General Requirements

The U.S. EPA does not currently require leak detection for field constructed tanks. At the time the 1988 UST regulations were promulgated there were no appropriate leak detection methods that could achieve the leak detection rates prescribed by U.S. EPA. In the mid 2000's, the Navy

implemented a program of soil vapor and groundwater monitoring to provide some indication that leaks from the tanks may be occurring. In 2009 the Navy began a biennial leak detection procedure at most of the tanks using a method developed by Mass Technology Corporation for bulk underground storage tanks greater than 50,000 gallons.

The objective of this task is for the contractor to review all available information provided by the Navy on the history of its leak detection efforts at the Red Hill Facility. The contractor shall evaluate the Navy's efforts and provide a report to the EPA on the effectiveness of the Navy's efforts. The contractor shall also evaluate alternative leak detection methods and procedures for bulk underground storage tanks and make recommendations for improved leak detection practices, if appropriate.

III. Assumptions

Due to the complex physical constraints, volume and age of the field-constructed USTs, assessing both the performance and potential for improving the leak detection systems for the tanks at the Facility presents a unique technical challenge. This contract requires specialized expertise in the following areas:

1) Extensive expertise and knowledge of best available technologies for precise measurement of liquids in large tank systems (greater than 1 million gallons) Ideally expertise with leak detection systems for field-constructed USTs with volumes over 1 million gallons of petroleum
2) Industry best practices for leak detection in large field-constructed fuel storage tanks. Ideally experience with large field-constructed USTs
3) Tank tightness testing methodologies for large field-constructed USTs
4) Structural engineering of large steel vessels and concrete containment structures
5) Extensive knowledge of American Petroleum Institute (API) Standards including, at a minimum, API 653, 650

The contractor will be required to assist EPA in evaluating the Navy's current leak detection systems at the Facility. The contractor shall have knowledge to assess the quality, precision, and accuracy of leak detection systems for large field-constructed USTs. The contractor shall have knowledge regarding historical and current state-of-the-art leak detection technologies and instrumentation. The contractor shall have experience installing, managing the installation, or being a member of team which installed leak detection systems at a large UST.

The contractor shall be familiar with tank tightness testing procedures for large field-constructed USTs. The contractor shall be able to assess the validity and effectiveness of such procedures under various conditions. The contractor shall be able to evaluate the precision and accuracy of tank tightness tests implemented for large field-constructed USTs.

The contractor shall have knowledge of the structural engineering principles associated with large steel and concrete containment structures and vessels. In particular, the contractor shall have knowledge of large concrete containment structures lined with carbon steel. The contractor shall have knowledge to determine the integrity of these structures and methodologies to determine the potential for releases from them.

The contractor shall be certified in, or have extensive knowledge of, at least one or more API standards for large containment vessels. The contractor shall be familiar with how API standards will effect implementation of various leak detection systems.

IV. Specific Task Description(s)

1. Project Management-
The Contractor shall identify the individuals and/or principles assigned to this contract. The resumes or curriculum vitae shall be included for each individual. After the Contractor has assigned the appropriate personnel to the contract, EPA and the Contractor shall have an initial meeting to discuss the scope of the work assigned and a subsequent planning meeting. The Contractor shall have at least monthly conference calls with EPA to discuss the Contractor. These monthly conference calls may be waived by EPA staff, depending on the status of work being performed for the tasks described below.

2. Existing Systems and Procedures Evaluation
In response to the January 2014 release and at the request of the regulatory agencies, the Navy has transmitted and continues to transmit historical documents and additional information pertaining to the underground fuel storage systems and leak detection techniques employed at the Facility. These documents vary from nontechnical reports to highly technical system specifications and leak detection methods. The Contractor will be required to review documents and other responsive information specifically identified or prescreened by EPA staff. The Contractor will be required to provide evaluation reports to EPA approximately within 21 days of receiving documents from EPA, unless otherwise directed by EPA.

During and following a review of Navy documents, the Contractor may be requested to identify additional information necessary to properly assess the state of leak detection systems at the Facility. After completing a thorough evaluation of the existing leak detection systems and procedures, the Contractor shall provide an overall assessment of the accuracy and precision of the current practices at the Facility considering site-specific conditions.

Documents are still forthcoming from the Navy, and EPA is assessing the breadth and depth of submissions.

3. Technical Consultation
EPA and the Navy regularly hold conference calls to discuss the Navy's regulatory requirements in response to the January 2014 release, any outstanding issues at the Facility, and ongoing negotiations involving EPA and the Navy. The Contractor will be required to attend a limited number of critical technical conference calls about leak detection systems at the Facility. The Contractor shall be able to quickly articulate issues related to advanced leak detection technologies, the current practices at the Facility, as well as provide technical expertise for EPA during discussions with the Navy.

We expect that the Contractor will need to attend roughly 10 conference calls.

3. Best Available Leak Detection Technology Analysis

As part of its ongoing discussions with the Navy, EPA is evaluating the current capabilities and potential for improvements to the Facility's tank leak detection systems. EPA staff must become familiar with the best available leak detection technology currently in industry, as well as practicable applications at the Facility, given the unique and complex technical challenges. The Contractor will serve as EPA's technical expert, surveying the best available technologies in the industry and determining what is feasible at the site.

The Contractor shall submit a technical report to EPA that includes a best available leak detection technology analysis. The analysis should contain some combination of the following elements: 1) a list of current technologies at large field-constructed tanks with a detailed description; 2) a determination as to whether a listed technology is feasible with justification; 3) an analysis of the precision and accuracy of all feasible technologies; 4) a cost estimate, including capital and maintenance costs, of all feasible technologies; and 5) an estimate to construct each feasible technology on one tank at the Facility and at all field-constructed tanks at the Facility.

This Analysis will require a breadth of industry knowledge regarding large petroleum tank systems. The Contractor shall be familiar with industry best practices involving leak detection and be able to amply justify cost estimates, measurement reliability and estimated installation schedules. We expect that the development of this report may take approximately 250 hours.

5. Travel and Facility Evaluation

During ongoing negotiations and in the development of the tasks above, the Contractor may need to travel to the Facility site in Pearl Harbor, HI. The Contractor will make no more than two trips to Honolulu, HI for a period of three days per trip. A trip would consist of a Facility tour, discussion with operations personnel, and attendance at meetings with EPA and Navy personnel.

VI. Milestones and Deliverables

Summary of Deliverables

Task	Deliverable	Due
1.	Scoping Meeting	Within 10 days of receiving SOW
	Project Plan	Within 10 days of the scoping meeting
	Monthly Status Calls	TBD
2.	Ongoing Document Review Summaries	TBD
	Ongoing Workplan Review Summaries	TBD
3.	Ongoing Consultation Emails	TBD
	Conference Calls	TBD
4.	Best Available Leak Detection Technology Analysis	Q3/Q4 FY 2015
5.	Onsite Facility Tour	Q2 FY 2015
	Onsite Negotiations	Q2 FY 2015